

CRASH COURSE IN PEDIATRIC DENTISTRY



DENTISCOPE

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Basics of child psychological development

Stages of phycosexual development [freud]:

- 1- Oral : First year of life – child is completely dependent on the mother
- 2- Anal: 1-3 years old – toilet training is done in this stage
- 3- Phallic : 3-6 years old – sexual identity develops
Kids at this stage have mutilation anxiety [they are afraid of being injured]
- 4- Latency: 6-12 years old – care free years
- 5- Genital :12- 18 years old

Stages of phycosocial development [Erikson]:

- Trust vs mistrust [oral stage – kid has separation anxiety]
- Autonomy vs doubt [anal stage – child should think that what the dentist is doing is their own choice]
- Initiative vs guilt [phallic stage]
- Industry vs inferiority [latency stage]
Ortho tx starts at this stage
- Identity vs role confusion [genital stage]

Object concept:

- 2-3 months – child will only observe at an object
 3-6 months – child will grab the object
 6-11 months – child will look for a hidden object

Before the age of 7 you explain things to the child using [immediate sensation] → tell the child that they need to brush their teeth so they looks white and nice and they have a very nice smell that everyone will like.

After the age of 7 you explain things to the child using [abstract reasoning] → you need to brush your teeth to prevent plaque and caries

Q: how is classic conditioning related to dentistry?

The child comes the first visit and sees you wearing a lab coat , you give them an injection [sth painful] , the next visit when they see a lab coat they start crying.



Behavior management

The first objective of behavior management is establishing communication

- **Positive reinforcement** = providing the child with a pleasant stimulus [high five, praise tap on the back etc]
- **Negative reinforcement** = remove a negative stimulus after the child behaves properly [ex: if they don't like your assistant, you tell them I can ask this person to leave but you have to open wide!]
- **Omission**: removal of pleasant stimulus [ex: taking away their fav toy]
- **Punishment**: giving un pleasant stimulus [ex: mildest form is voice control, withdrawal of fun activities]

Positive reinforcement types :

- 1- Direct : gifts and rewards [most effective]
- 2- Vicarious : watching someone else getting a reward
- 3- Self administered : child feels proud of being good

Q: how do you establish effective communication with the child? Before the child gets in you already know their name, what they like what is their nickname, fav superhero etc.. get down to their level [your eye level should be the same and the child's eye level] and talk to them.

Behavior rating scales

Frankl scale :

- **Definitely positive** : very cooperative
- **Positive** : accepts tx but is sometimes cautious
- **Negative** : reluctant to accept tx
- **Definitely negative** : refuses tx

Wright's scale :

- **Cooperative** : most children
- **Potentially cooperative** :
- **Lacking cooperative ability / pre cooperative [very young or special needs patients]**
- **Objective fear** : caused by direct physical stimulation [ex: you gave the child an injection that was painful]
- **Subjective fear**: feelings and attitudes suggested by others [ex: the child's friend will tell them that they went to the dentist and the dentist hurted them a lot]



Q: what can you do to positively affect a child's behavior in the clinic?

- 1- Gather data about the child before they enter [their fav toy, nick name etc..]
- 2- Structure your treatment [explain to the child before each stage of the treatment or show them on a model]
- 3- Distract the child during the procedure [make them hold the suction or watch cartoons etc]
- 4- Be flexible [accommodate each child's needs]
- 5- Wear colorful colors and scrubs [avoid wearing a lab coat]
- 6- Make sure the clinic's environment is friendly and pleasant
- 7- Make appointments short [because kids have short attention span] + make them in the morning when they will be well rested and more cooperative

Behavior modification

- 1- **Desensitization:** Tell show do [tell them what you will do , show them on a model and then do it on them] – make sure your communication with the child is very simple and link it to things they know [syringe = special water , LA = sleeping medicine for the tooth , rubber dam = rain coat for your teeth etc..]
- 2- **Modeling :** the child watches other kids or videos of kids getting treatment and behaving properly → the child will later behave the same way
When the child watches a video of other kids getting tx this is called **vicarious modelling**
- 3- **Contingency management:** presentation or withdrawal of reinforces [positive reinforcement = giving gifts, praise, high fives etc]

Behavior management

- 1- **Voice control :** loud voice to gain child's attention then go back to your normal tone.
- 2- **Physical restraint [aversive conditioning]:** you need to brief the parents before + get consent
 - A. **Mouth props :**
 - At the time of injection
 - When children become fatigued
 - Stubborn or defiant children
 - Mentally / physically handicapped children
 - Very young children
 - B. **Parent / assistant :** parents sit in the dental chair with the child in their lap, the parents place one hand over the forehead and the other over the child's hands
 - C. **Body wrappings : papoose boards, Vac pac**
 - D. **Hand over mouth [HOME] : firmly place your hand over the child's mouth until the verbal outburst stops - Done to :**
 - Gain child's attention
 - Stop verbal outburst + Establish communication

indications	Contraindications
Normal children who become momentarily defiant or hysterical Child is mature to understand simple verbal commands	Very young children Immature and frightened children Physical / mental / emotional handicap



3- Pharmacological management:

- **LA :** Maximum allowed dose of LA = 4.4 mg / kg [one carpule for every 10 kgs]
- **Oral sedation:** desired effect is seen in 30 -60 mins

Adv: no injections, you give it orally and the child starts to get sleepy then you work on them

Disadv: child is still not fully cooperative because they are sleepy and cranky + you can't titrate the dose

- **Intramuscular sedation:** desired effect is seen in 20 mins – injection sites:

- A. Upper outer quadrant of gluteal region
- B. Anterior aspect of the thigh
- C. Middle of the posterior lateral aspect of the deltoid

- **Intravenous sedation:**

pt is still conscious

benzo diazepine – desired effect is seen in 20-25 seconds

once you see dropping of the eye lids → pt is well sedated



Early childhood caries - ECC

ECC = nursing bottle caries , baby bottle tooth decay

- A. Seen in infants and preschool children [below the age of 6]
- B. Demineralization at the necks of the upper incisors – mandibular incisors are not affected
- C. Decay pattern:
 - Maxilla: incisors , canines, first molars
 - Mandible: canines , first molars
- D. Lesion progresses to grind the necks of the teeth in advanced cases only a root stump is left

Q: why does ECC follow this specific pattern?

- 1- Chronology of primary tooth eruption
- 2- Duration of the deleterious habit [bottle feeding]
- 3- Muscular pattern of infant sucking



Early colonization of MS is the most imp risk factor for developing ECC – MS transmission can be through the mother or from peers [other kids]

MS Colonization of pre dentate children is mostly associated with maternal factors [high level of MS in the mother, poor OH and active caries]

Q: how is nocturnal bottle feeding / breastfeeding related to ECC?

When child laid to rest, the bottle or breast nipple rests against the palate and tongue covers the lower incisors [that's why they are not affected] - As the child becomes sleepy, saliva flow and swallow reflex are reduced → Sugar remains stagnant around the neck of the teeth

Q: what practices increase the chance of developing ECC?

- 1- Prolonged night time bottle feeding
- 2- On demand breast feeding after the age of 1
- 3- Frequent snacking with sugary foods
- 4- Frequent sipping of sugary drinks throughout the day

Q: why should you treat ECC ?

- 1- Relieve pain
- 2- Prevent infection
- 3- Improve child's self esteem
- 4- Retain teeth → maintain proper nutrition, occlusion and speech



Q: how would you manage a case of ECC?

- 1- Identify the cause and stop the habit
- 2- Give parental instruction on proper oral hygiene measures + diet counselling
- 3- Decide if the case can be managed in clinic [with regular LA or nitrous sedation] or the child needs GA
If the case is treated in the clinic : full assessment of all affected teeth to know which teeth can be restored, which need pulp therapy and which need extractions

Q: what instructions would you give the parents to a child with ECC?

- 1- STOP NIGHT TIME BOTTLE FEEDING / stop breast feeding at will after the first tooth erupts
- 2- Feed the child while being held + burp the infant after feeding
- 3- Clean the teeth after each feeding [wipe the teeth with a wet gauze]
- 4- regularly lift the upper lip to check for signs of demineralization of the upper Anteriors
- E. OH should start with the eruption of the first tooth – wipe the teeth with gauze and for ages 2-6 brush with low fluoride tooth past [400-500 ppm] – parental supervision until the child can properly spit
- F. Children are encouraged to drink from a cup as they become 1 year old
- G. Avoid frequent snacking and have regular meals instead
- H. First dental visit should be combined with immunization dates [at or before 6 months]

Prevention of ECC ideally begins pre nataly:

- 1- give the mother information about diet and OH
- 2- treat the mother's own oral diseases and lower MS count by mouthrinses and restorative care
- 3- educate the mother on modes of transmission of MS [don't lick spoons or pacifiers etc..]



Caries in Permanent teeth

- Primary dentition = from 4-6 months till 6 years
- Mixed dentition = 6- 12 years old
- Permanent dentition = when all primary teeth are replaced with their permanent successors

Caries in mixed or permanent dentition have the same predisposing factors [diet high in refined carbohydrates , poor OH, decreased salivary flow etc..]

Diet analysis [24 hours diet chart] = should be filled for 7 days [must include a weekend – because the child will eat different types of food when they are not at school]

Q: what salivary parameters should you measure when you are determining caries risk?

- 1- Consistency : thin or viscous [thin watery is better – but not too thin because it means it's protective contents are also diluted]
- 2- PH and bicarbonate content [bi carbonate content neutralizes acids in the mouth]
- 3- Ca/ Po4 /fluoride content [to determine the ability of remineralization]
- 4- Immunoglobins content [ability to resist caries]
- 5- Flow rate

Q: if the child has high MS count , how can you lower it? Treat gross caries + prescribe antibacterial mouth wash if the child is above 6 yo.

most to least susceptible teeth : first molar → upper molar → second molars → premolars → upper centrals & canines → lower centrals and canines

NOTE: when caries level is low most of the caries occur on the occlusal surfaces [pits and fissure caries] as caries level increase the proximal and smooth surfaces get affected as well.

Fluoride protects against smooth and proximal surface caries but not against pits and fissures [that's why even in fluoridated areas you'll still see Pits and fissure caries that need to be prevented by fissure sealants]

If the child has caries on their primary dentition they will mostly develop caries in their permanent dentition as well. [because the oral environment is not changed – this is why it is important to treat caries in the primary dentition + improve OH and diet to prevent caries in the permanent dentition]

Caries on the distal of E → will increase the risk of developing caries on the mesial surface of the 6 by 15 times [even if the lesion is arrested you need to restore it because the hole will accumulate food and plaque → bacterial colonization and caries on the mesial surface of the 6.

If you detect caries on one arch → examine the opposing arch & if you detect on one side → examine the contralateral side

Hidden [occult caries] = the surface is intact and well mineralized but actually the lesion is huge inside the tooth because caries progress underneath – this is mostly seen in well fluoridated areas .

- **Best management of hidden occult caries is early detection using radiographs**

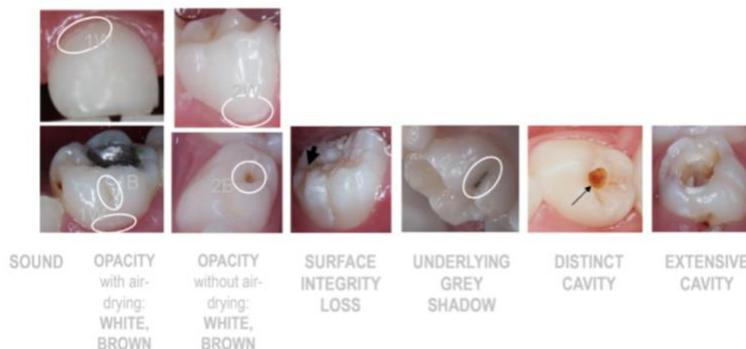


NOTE: worldwide there was a decrease in caries prevalence because of water fluoridation but then caries prevalence increased again because many countries stopped water fluoridation and investing in other programs + the diet changed and became more cariogenic [processed foods, high sugar foods etc]



Restoring caries in young permanent teeth

ICDAS = you must clean the tooth surface first before you determine the score [otherwise caries will be underscored] – detect surface discontinuity with a perio probe not a sharp explorer because it can induce cavitation.



- 0 = sound tooth
- 1= opacity when drying the tooth
- 2= opacity without drying the tooth
- 3= microcavities – loss of surface integrity
- 4= underlying shadow
- 5- 6= cavitation

Caries risk in pediatric patients						
Low	Moderate	High				
<ul style="list-style-type: none"> - Optimal fluoride exposures both systemic and topical - Consumption of simple sugars limiting to mealtime - High caregiver socioeconomic status (financially stable) - Regular dental visits 	<ul style="list-style-type: none"> - Suboptimal systemic fluoride exposure with optimal topical exposure - Between meal snacking (1-2) - Midlevel caregiver socioeconomic status - Irregular use of dental services 	<ul style="list-style-type: none"> - Suboptimal topical fluoride exposure - Frequent between meal snacking (3 or more) - Low level caregiver socioeconomic status. - No usual source of dental care - Active caries present in the mother - Children with special health care needs Conditions decreasing saliva flow (medications, radiotherapy) 				

Examine the tooth surface :

- If you suspect caries → take BW [enamel caries do PRR , dentine caries drill and fill]
- If you are sure there are no caries → seal with fissure sealant

If the first permanent molar has deep caries and signs of pulpitis:

- A. Crowding present → do ortho consult → extract the tooth [usually all 4 first molars are extracted to allow the 7 and 8 to drift mesially and fill the space]
- B. No crowding →
 - Acute pulpitis → pulpotomy [CaOH₂ or MTA]
 - Chronic pulpitis → apexification or pulpectomy

Before extracting the first molars you need to verify that the child has 3rd molars [radiographical evidence of 3rd molars is usually seen at 9 year and 6 months]

- If you are using composite ideally use **etch and rinse adhesive systems** [it will result in the strongest bond but it results in a higher chance of **post op sensitivity** and needs a **cooperative child**]



- Self etch adhesives will save time and are perfect for **uncooperative child** and results in **less post op sensitivity** but they result in a **weaker bond**.
- **Self etch adhesives are very hydrophilic, If you are using self etch adhesives → apply a layer of flowable composite over it to make it more hydrophobic**
- **Diamond burs leave more uncut collagen fiber → better bond strength**
- When you are bonding to enamel → make sure the cavity is dry
- When you are bonding to dentine → the cavity should not be very dry and slightly humid to erect the collagen fibers and get better bonding

To ensure max bond strength :

- 1- Use etch and rinse adhesive systems when you can – if you use self etch cover it with a layer of flowable composite
- 2- Use diamond burs to leave more uncut collagen
- 3- Make sure if the cavity is in dentine that it is not too dry [to erect the collagen fibers]

Stainless steel crowns for permanent teeth:

- 1- Hypoplasia / hypomineralization
 - 2- Large carious lesions and lesions requiring pulp therapy
 - 3- Special needs patients
- If stainless steel crown is placed on a perm tooth you need to adjust the crown margins** and this is temporary until the child reaches 18 and can get a PFM or a porcelain crown.

Hypoplastic anterior teeth can be treated by:

- 1- Microabrasion
- 2- Small saucer like preparations over the discolored areas and then fill them with composite



Restorative materials for primary teeth

Q: why do you need to restore primary teeth ?

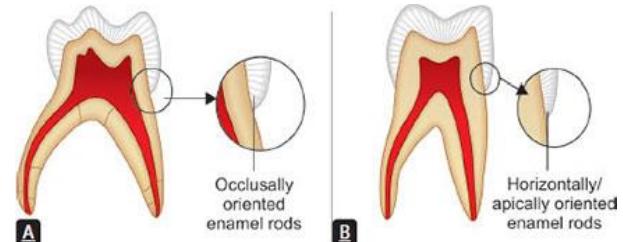
- 1- Restore function [mastication, speech , occlusion, esthetics]
- 2- Relive pain and prevent spread of infection
- 3- Maintain occlusal height and arch length [by restoring proximal caries]
- 4- Prevent the need for extractions and loss of space
- 5- By restoring primary teeth + reinforcing OH → you change the oral environment → less chance of caries in the perm dentition
- 6- Prevent possible damage to perm teeth [ex: untreated infection in primary teeth can lead to turner's tooth in perm teeth]

Q: how is restoring primary teeth different from restoring permanent teeth?

- 1- Primary teeth have limited life span
- 2- Variable levels of cooperation by the child
- 3- Primary teeth have different morphology

Q: how is the morphology of primary teeth different from permanent?

- Greatest convexity is at the cervical 3rd
- Different MD width and crown height
- Enamel and dentine are thinner [high chance of pulp exposure]
- Larger pulp with more prominent pulp horns [high chance of pulp exposure]
- **Pulp is closer to the mesial surface**
- Contact areas are broad and flat
- Roots are longer , more slender and more flared
- Enamel rods at the cervical region are directed occlusally



Q: how are materials used to restore primary teeth different from perm teeth ?

- 1- Materials used can have **less longevity** [less wear resistance, less durability and less ability to withstand masticatory forces]
- 2- Have **adequate strength even if placed in less bulk**
- 3- Materials must have **quick setting reaction**
- 4- Able to **work in moisture** and **less technique sensitive**
- 5- **Have good adhesive properties** since less cavity prep is required

NOTE:

If after caries excavation you are not sure of the prognosis of the tooth → place GIC

- A. Pain goes away → remove a little bit of the GIC and place composite
- B. Pain is still there → consider pulpotomy / pulpectomy then composite or SCC



Stainless steel crowns [SCC]

Indications :

- After pulpotomies / pulpectomies
- Multisurface caries / fractured teeth
- Developmental defects [amelogenesis / dentinogenesis imperfecta]
- Wear and loss of occlusal height
- Young kids with high caries risk being treated under GA
 - Full coronal coverage but poor esthetics – this can be fixed by placing a labial veneer with composite [the veneer usually debonds + it's very expensive to place]

Procedure : <https://www.youtube.com/watch?v=sBYXJjgXKZQ>

- 1- Check occlusion before you start
- 2- Select crown size [proper MD width, height and SLIGHT resistance to seating]

Bring 3 crown sizes before you start [the actual size you think will fit , one size bigger and one size smaller]
- 3- Adequate LA [block or STA (single tooth anesthesia)]
- 4- Occlusal reduction [1 – 1.5 mm] following cusp anatomy

Occlusal reduction should be done before caries removal or pulpotomy [or you can do pulpotomy – restore the tooth and then do occlusal reduction]

You can check occlusal reduction by comparing the tooth to the adjacent marginal ridge [it should be 1.5 mm lower than the marginal ridge of the adjacent tooth] or you ask the child to bite on Aluwax [if you have enough reduction you will not see any perforations in the wax]
- 5- Caries removal / pulpotomy
- 6- Restore tooth after pulpotomy
- 7- Interproximal reduction [just open the contact] + bevel all line angles

No buccal reduction is made because you want the bulge of the cervical region buccally to aid in retention of the crown
- 8- Try the selected crown by placing it on the **LINGUAL side then rotating it towards BUCCAL**
- 9- Using an explorer make a scratch line on the gingival margin – remove the crown and using scissors or acrylic bur cut 1 mm below the scratch line then reinsert the crown
- 10- Check for any gingival blanching [blanching means you need to trim a little bit more from the margins]
- 11- With crimping pliers crimp the margins to fit into the undercuts of the prep → after this the crown should snap into position under firm pressure – seat the crown again and check all the margins [any open margins → crimp again]

Crown should have proper occlusion – same marginal level as adjacent – **margins should be 1 mm below gingival margin**
- 12- finish the cervical margin with finishing stones and polish
- 13- cement the crown using RMGIC – place a cotton roll and ask the child to bite down – remove excess + the marking on the buccal side



TIPS:

- if you are placing crowns on the first and second primary molars → do more interproximal reduction + fit the crown on the second molar first
- if the 6 did not erupt yet make sure you do enough distal reduction of the primary second molar [if you place an over sized crown on E → ectopic eruption or impaction of the 6]
- most common size for D = 4 or 5 most common size for E = 4

in class II → the width of the isthmus is $\frac{1}{2}$ the occlusal table width + you round the axiopulpal line angle

Restorative materials in pedo :

Amalgam – rarely used [sometimes used if moisture control is very difficult]

Resin composite [highest esthetics + good micromechanical retention by acid etching – technique sensitive and requires good moisture control + cooperative child]

GIC [bonds chemically to the tooth structure - can be placed if moisture control is not excellent – poor esthetics – releases fluoride + gets recharged with fluoride every time the child brushes, poor wear resistance]

RMGIC [resin + GIC → chemical bonding + light curing , stronger than GIC and better esthetics]

Compomers [used if you want a material that is stronger / more esthetic than GIC but less technique sensitive than composite]

THE GOLD STANDARD MATERIAL IN PEDO IS PACKABLE COMPOSITE – USED IN ALL CASES

Fissure sealants: for deep fissures – you etch and then apply [no bonding]

PRR if there are carious areas on the occlusal surface you drill those areas slightly place flowable or packable composite and fissure sealants on the rest of the fissures

PRR TYPES:

- Type A – caries are confined to the enamel
- Type B – caries are small but extend to the dentine
- Type C - caries are deeper into the dentine



Restoring primary anterior teeth :

Single discolored tooth due to trauma but the tooth is vital → treat by a labial composite veneers

Full coronal coverage for anterior teeth is indicated when:

- 1- Multisurface caries / Caries involving incisal edge
- 2- Extensive cervical decalcification
- 3- After pulpotomy / pulpectomy
- 4- Very poor oral hygiene - high risk caries
- 5- If you are doing treatment under GA

Composite strip crowns [cellulose crown former]:

- 1- Incisal reduction + remove caries
- 2- Proximal reduction
- 3- Trial fitting of the cellulose crown – make a hole on the palatal surface
- 4- Etch the tooth – wash and dry then apply bonding
- 5- Fill the crown with composite resin - remove excess from the palatal hole and cure
- 6- Remove the crown former - usually no need for finishing but make sure you remove any excess cervically

Anterior SCC : not esthetic but a labial composite veneer can be added

Esthetic primary anterior crowns [zirconia crowns]



Pulp therapy in primary teeth

In primary teeth the initial signs of pulpal inflammation are seen in between the roots because Pulp chamber floor is very thin and porous + most accessory canals open into the furcation area [at a later stage the PA region will have a radiolucency as well]

Q: when can you only treat by a restoration ?

- 1- Caries confined to the enamel or slightly into dentine
- 2- No symptoms or pain [or signs of reversible pulpitis]
- 3- No signs of irreversible pulpitis
- 4- PDL + PA region are sound radiographically

Q: why is the pulp easily affected in primary teeth ?

Primary teeth have thin enamel + large pulp chambers + wide DT → inflammation easily reaches the pulp

PULP THERAPY	
INDICATIONS	CONTRAINDICATIONS
Bleeding disorders and coagulopathies [hemophilia and von willbrand disease] <i>In such cases you want to avoid extraction because you don't want bleeding</i>	<ul style="list-style-type: none"> • Congenital heart disease [risk of infective endocarditis] • Immunocompromised pt [cancer pts and long term corticosteroid users] • Poorly controlled diabetics [poor healing potential] • Special needs / disabilities <i>In such cases you want to extract and not do pulp therapy because you don't want to leave a source of infection</i>

- If the tooth is close to its shedding time → extract don't do pulp therapy
- Pulpotomies and pulpectomies are better done on young primary teeth that will stay for a long time
- If the child has on and off pain that is not annoying them very much → do indirect pulp capping [remove caries and keep affected dentine → apply CaOH₂ then GIC]
- You can't really depend on history of pain in children to determine pulp status because children don't really know how to describe the pain
- If the tooth is mobile → indicates pulp necrosis + PA involvement

After pulp therapy posterior teeth should be restored with SCC and Anteriors with strip crowns
[celluloid crowns]

**PULP THERAPY :****Indirect pulp capping**

- There should not be any signs of pulpitis
- Remove caries → keep affected dentine [make sure DEJ is free of caries] → place CaOH₂ then ZOE followed by GIC [if you want excellent coronal seal → place composite over the GIC]

Direct pulp capping [NOT DONE IN PEDO]

- Unsuccessful in pedo
- Pulp is already inflamed so if you place pulp capping material → internal root resorption

Pulpotomy : removal of the coronal pulp tissue

Indications	Contraindications
<ol style="list-style-type: none">1- Pulp is reversibly and minimally inflamed2- Destruction of marginal ridge in first primary molar3- Radiographic evidence:<ol style="list-style-type: none">A. Caries extends >2/3 depth through dentineB. No sign of pathological root resorption4- Minimal hemorrhage on pulpotomy5- Tooth is restorable	<ol style="list-style-type: none">1- Spontaneous, unprovoked pain [Signs of irreversible pulpitis / necrosis]2- Intra-oral swelling3- Mobility4- On coronal pulp removal:<ol style="list-style-type: none">A. No haemorrhage - necrotic pulpB. Hyperaemia - irreversible pulpitis5- Tooth close to the date of exfoliation6- Non restorable tooth





Pulpotomy procedure :

- 1- Adequate LA
 - 2- Use large size round bur to remove all caries and overhangs
 - 3- Spoon excavator to remove all soft caries
 - 4- Use low speed round bur to open and de roof the pulp chamber
 - 5- If the pulp is inflamed it will start bleeding → with spoon excavator or large round bur remove the pulp from the pulp chamber
 - 6- Control hemorrhage by applying a cotton soaked with CHX or saline
 - 7- Place ferric sulfate [formacresol] or MTA
 - 8- SCC / anterior strip crown
- if you place Ferric sulfate in a cotton pellet for 1 min then remove the cotton and place ZOE or IRM
 - if after removing the coronal part of the pulp chamber, radicular pulp still bleeds → you need to do pulpectomy

Do We Still Need Formocresol in Pediatric Dentistry?

<https://www.cda-adc.ca/jcda/vol-71/issue-10/749.pdf>

Insert a small file inside the canals and remove the pulp tissue → enlarge to 2 sizes larger using files → irrigate with saline / CHX → dry canals and place Metapex [CaOH₂ + iodoform] → place ZOE then GIC then composite and next session prepare for SCC

Q: what medications can be used for pulpotomy ?

- 1- Formocresol – **contains formaldehyde (carcinogen)** – bactericidal
- 2- Ferric sulphate – excellent hemostatic agent but no bactericidal effect
- 3- **Calcium hydroxide [not used in primary teeth because it causes internal resorption - used only for Cvek partial pulpotomy in permanent teeth]**
- 4- Glutaraldehyde
- 5- Electrosurgery
- 6- MTA

Q: how can you know that the pulpotomy worked?

- 1- No radiographic evidence of internal resorption
- 2- No breakdown of periradicular tissues
- 3- No symptoms like pain or swelling

Material from inside to outside : MTA → ZOE → GIC → composite → SCC

Pulpectomy : removal of the coronal pulp tissue + radicular pulp tissue

Indications	Contraindications
<ol style="list-style-type: none"> 1. Evidence of pulpal necrosis 2. Hyperaemic pulp / irreversibly inflamed 3. Evidence of furcation / periapical involvement on radiographs 4. Spontaneous (unstimulated) pain 	<ol style="list-style-type: none"> 1. Non restorable teeth 2. internal root resorption 3. Mechanical or carious perforations of the floor of the pulp chamber 4. bone loss 5. Presence of dental or follicular cyst



Q: what medications can be used in pulpectomy?

- 1- calcium Hydroxide (Vitapex - CaOH + iodoform)
- 2- Zinc Oxide Eugenol (**non - reinforced**) – **paste consistency in the chamber and thin consistency in the canals but takes time to mix and place**
- 3- Iodoform paste (e.g. Kri paste)

If pulpectomy fails → you need to extract the tooth

Long term success after pulp therapy depends on coronal seal

Most failure in pulp therapy is due to inappropriate case selection [diagnosis]



Fluoride modalities in pediatrics

Q: what are the protective mechanisms of fluoride?

- 1- Fluoride changes HA crystals to fluoro apetite crystals which are more acid resistant and less soluble
- 2- Fluoride binds to proteins in plaque and stays there to be released when the PH drops below 5.5
- 3- Fluoride inhibits bacterial enolase → inhibits acid production

Fluoride acts in 2 ways:

- A. **Pre eruptive** : fluoride gets incorporated into the enamel while the → makes enamel stronger + alters the grooves and makes them less plaque retentive
- B. **Post eruptive**

NOTE: the percentage of fluoride in the water depends on the climate of the place [cold countries → fluoride in water = 1 ppm , hot countries fluoride in water = 0.7 ppm]

Fluoride varnish / mouthwashes are contraindicated in children below 6 because they will swallow most of it.

- Ages 2- 6 years old → low fluoride containing toothpaste [400- 600 ppm] – smear or pea amount - **Children above 6 and at high caries risk → use toothpaste with 1000 ppm**
- If the child is at high risk you tell them to spit and not rinse after brushing.
- children should be monitored until the age of 6-8

Fluoride varnish: DURAPHAT [5% sodium fluoride] – 2.26 % fluoride ion

- wipe the teeth with gauze to dry them → apply varnish onto tooth surface [you can use absorbing dental floss and insert fluoride interproximally]
 - the varnish will form a sticky coat on the teeth that dissolves slowly over several days [maximum absorption of fluoride into the tooth surface and minimal risk of fluoride ingestion]
 - fluoride varnish also increases the fluoride content of saliva
- CAUTION:** instruct the child to not eat or drink for 1 hour and do not brush their teeth same day of the application
- Fluoride varnish tubes are no longer used because the fluoride used to settle in the lower end of the tube and there would not be equal concentration of fluoride all over the tube.
- Even if you are using fluoride packs make sure you mix it well before application

Prophylaxis does not increase the effect of fluoride – applying it over plaque is more beneficial [Fl is released when PH drops below critical point]

Q: do you need to do prophylaxis before placement of fluoride varnish / APF gel? If there is a lot of calculus / plaque with gingival inflammation → do prophylaxis and apply fluoride in the NEXT session [because there will be bleeding when you do prophylaxis]



But if plaque is minimal keep it and apply fluoride [fluoride will adhere to the proteins in the plaque and release when the PH drops below 5.5]

APF gel : 1.23% acidulated phosphate fluoride gel

- **CAUTION:** APF gel contains hydrofluoric acid to increase enamel porosity then fill it with fluoride to change HA into FA crystals – but it **cannot be applied if the child has open carious lesions** [the acid will easily reach the pulp]
If there are enamel or dentine lesions you can still use APF , you only can't use it if there is frank cavitation [in this case use sodium fluoride varnish]
- recommended at **ages 6- 18 , every 3 – 6 months** for an application **time of 4 minutes**
- APF has 3 types :
1 minute foam
1 minute gel
4 min gel [the only one that is effective]



application: APF gel is applied in foam trays [both upper and lower arches are together]

- 1- Load 3rd of the tray with the gel and insert both upper and lower trays into the mouth at the same time
- 2- Ask the child to grind or chew to change the thixotropic gel into a solution allowing it to go interproximally
Application time = 4 minutes
Patient should be **sitting up right with head tipped forward** and has high saliva ejector in their mouth
- 3- Ask the child to spit for 1 minute after application
Child should not eat / drink for 30 mins

Silver diamine fluoride [SDF] : applied on active carious lesions to arrest them.

- Active component is **SILVER** [anti bacterial and anti fungal – when applied will stabilize all cariogenic bacteria in the cavity – the lesion is then mineralized by fluoride]
- Ammonia is added to stabilize silver

Drawback of SDF: when applied it changes the carious lesions black.

SDF/ KI [Riva star] : SDF alone will cause the lesion to turn black but if it is coated by potassium iodide the lesion does not change color [remains brown]

Indications of SDF:

- 1- Caries control in all ages
- 2- Extreme caries risk [xerostomia / ECC]
- 3- Tx Behavioral / medical compromised pt [hospitalized pts , eldery , uncooperative children]
- 4- If you can't treat all lesions in one session

SDF can also be applied for : Acute pulpitis / as cavity liner / indirect pulp capping



Application of SDF :

- 1- Dry the tooth surface
- 2- Apply 1 drop / kg of body weight per visit
- 3- Apply for 1 minute then rinse
- 4- You can cover SDF with GIC or composite

Titanium tetrafluoride

- Excellent for caries and tooth erosion – results in glazed like layer
- Higher and more rapid uptake of fluoride because each titanium ion hold 4 fluoride ions that quickly remineralize any demineralized spot

Sorbitol in toothpaste = laxative

Nitrate containing toothpastes [used to reduce hypersensitivity] = can cause methemoglobinemia

Fluoride supplements:

Indicated only in high risk children whom dental disease will cause a risk to their general health [children at risk of infective endocarditis]

They are **only effective if they are given over a long time** – the aim is to make the child caries free to a point where you don't need to do any Tx. [because each procedure would require prophylactic ABX]

Q: what would you consider before prescribing fluoride supplements ?

- 1- Age
- 2- Caries risk
- 3- Other sources of fluoride [specially content of fluoride in drinking water]

Age	Fluoride in water	
	<0.3 mg/ L	0.3 – 0.5 mg / L
6m – 4 years	0. 25 mg	0
4 - 8 years	0.5 mg	0.25 mg
8 +	1 mg	0.5 mg

Q: how much fluoride supplements should an 8 YO child take who drinks Fluoridate water that has less than 0.3 mg/ L fluoride ? 1 mg of fluoride

Probable toxic dose = minimal dose that can cause toxic signs and symptoms = **5mg / kg of body weight per day**

GIT symptoms can occur at 3-5 mg / kg of body weight

Certain lethal dose = 32- 60 mg / kg of body weight



Fluoride toxicity:

Symptoms : nausea, vomiting, diarrhea, abdominal cramps convulsions , cardiac and respiratory arrest

Management:

- 1- Know the type , amount, concentration and time of fluoride ingestion + child's weight
- 2- Minimise further absorption by giving calcium products [milk,yougurt , calcium gluconate, or anti acids containing calcium carbonate]
- 3- DO NOT INDUCE VOMITING
- 4- Monitor vital signs and seek medical help ASAP

Dental fluorosis:

Increased fluoride concentration within the microenvironment of the ameloblasts during the period of enamel formation.

A daily dose higher than **0.05mg of F per 1 kg body weight per day for children with developing teeth can lead to risk of fluorosis.**

- 1 year old weight 5 Kg= the max dose 0.25mg F ion per day.
- 2 year old weight 10Kg= the max dose 0.5mg F ion per day.
- 4 year old weight 15 Kg= the max dose 0.75mg F ion per day.

Management :

- Mild fluorosis → **Surface remineralisation – CPP-ACP (Tooth Mousse)**
- If enamel surface is defective → **microabrasion:** Dilute hydrochloric acid / 35% Phosphoric acid and pumice paste, followed by remineralisation with topical F or artificial saliva
- Severely discolored enamel / mottling and loss of portions of enamel → Composite resin buildup or Veneers [Composite / porcelain]

Fluoride calculations:

To find the percentage of fluoride divide the percentage of the gel by the molecular weight .

What is the percentage of fluoride in 1 ml of 1.23 % NAF gel ?

$$1.23 / 2.2 = 0.56 \%$$

Molecular weight of sodium fluoride
= 2.2

Molecular weight of stannous fluoride = 4.1

What is the percentage of fluoride in 1 ml of 0.6 % SnF₂ gel?

$$0.6 / 4.1 = 0.15 \%$$

Then if you want to get the amount of Fluoride in ml → multiply the fluoride % **by 10.**

$$0.56 \% \text{ fluoride} = 5.6 \text{ mg F/ ml}$$



0.15 % fluoride = 1.5 mg F/ ml

Then if you want to get the amount in PPM → multiply the mg/ ml by 1000

5.6 mgf/ ml = 5600 ppm 1.5 mgf/ ml = 1500 ppm

APF gel [the % of APF gel = the % of fluoride] – Ex: 1.23 % AP gel has 1.23 % fluoride → 12.3 mgF/ ml and 12300 ppm

You first find % then mgF / ml then ppm

Fluoride toxicity calculations

A 2 year-old child weighing 10kg swallows one tube of toothpaste (90g of a 0.76% MFP toothpaste):

Fluoride dosage ingested: 90mg/10kg= 9mg/kg [PTD = 5 mg / kg]

3 year old ingested 25 NaF tablets - each tablet has a concentration of 1mg F ion and the child's weight is 14kg:

- Since the child swallowed 25 tablets each containing 1mgF → total swallowed = 25 mg F
- PTD = 5 mg / kg → 5 X 14 = 70 mg F [this is the dose that would kill the child]

Teeth will be affected by fluoride toxicity : [helps you know which teeth will be at risk of fluorosis depending on the child's age]

Permanent	Initial Calcification	Crown complete
Maxillary central	3 months of age	4 years of age
Mandibular central	3 months of age	4 years of age
Mandibular lateral	5 months of age	4 ½ years of age
Maxillary lateral	1 year of age	5 years of age
Canine	5 months of age	4 ½ years of age
1 st premolars	1 ½ - 2 ¼ years of age	6 ½ years of age

A daily dose higher than 0.05mg of F per 1 kg body weight per day for children with developing teeth [during calcification] can lead to risk of fluorosis

If the crown is fully formed → no risk of fluorosis



Inhalation sedation

Conscious sedation

- A state of depression of the central nervous system
- Reduces anxiety
- Patient is still able to **independently maintain an open mouth, adequate function of protective reflexes (e.g laryngeal reflex) & respond to verbal commands**

Nitrous oxide

- **The only agent that meets conscious sedation requirements**
- **Low solubility in blood** which causes it to have a **very rapid onset & recovery time**
- Produces euphoria and depresses the CNS

Nitrous oxide sedation	
Indication	Contraindication
<ol style="list-style-type: none"> 1. Patients who are mild to moderately anxious [Fear of needles/ needle phobic] 2. Child with some special needs or medically compromised 3. When profound LA cannot be obtained 4. Patients with a gag reflex or persistent fainting 5. Prolonged or unpleasant treatment 	<ol style="list-style-type: none"> 1- Inability to communicate or very young children 2- Child fears the mask 3- Mouth breathing 4- Cold / rhinitis 5- Chronic obstructive airway disease 6- Otitis media 7- Muscular depression activity 8- Psychiatric disease

NOTE: ASTHMA IS NOT A CONTRAINDICATION FOR USING NITROUS SEDATION

ASA I	Normal healthy patients
ASA II	Patient with mild Systemic disease
ASA III	Patients with severe systemic disease that is limiting but not incapacitating.
ASA IV	Patient with incapacitating disease that is a constant threat to life.
ASA V	Patient not expected to live more than 24 hours

ONLY INDIVIDUALS IN GROUP ASA I AND ASA II ARE SUITED TO RECEIVE CONSCIOUS SEDATION

Nitrous oxide causes slight depression in cardiac output but the peripheral resistance is increased this is why the BP is not affected

Nitrous oxide suppresses gag reflex but increases risk of nausea

Technique of administration:

1. Select the correct nasal hood size [the mask should fit snuggly around the nose]
2. Patient assessment and baseline monitoring should be carried out.



3. Introduce 100% oxygen for 1 –2 minutes
4. The level of N₂O is increased in 5 –10 % increments until signs of sedation are observed
(minimum O₂ concentration = 23%)
5. The end point will vary, usually between 30 –40% of nitrous oxide
6. Dental treatment can usually commence within 5 minutes of induction
7. If patient appears over sedated N₂O may be decreased by 5 –10 % the patient will be less sedated in 30 to 60 seconds.
Lack of response to any command indicates that treatment should be terminated and 100% oxygen delivered.
8. Once treatment has been completed N₂O flow is terminated and **100% oxygen is given for 3 –5 minutes** to decrease the possibility of diffusion hypoxia.

Slow induction

- for inexperienced operators and older patients
- Begin with **100% O₂** then increase N₂O concentration by 10% every minute until desired effect is reached.

Rapid induction

- for younger children
- risk adverse effects is greatly increased
- Patient is introduced to **40% N₂O** and after 2-3mins of careful monitoring, the dose is titrated accordingly

Signs and symptoms of N₂O sedation [relative analgesia]:

- 1- Floating sensation / heavy feeling
- 2- Feeling of warmth
- 3- Tingling in extremities + numbness of lips
- 4- Voices, sounds seem distant
- 5- Relaxation of skeletal muscle + eyes take on distant gaze

Early to ideal sedation

- Light headed
- Warmth
- Tingling sensations + numbness of the lips
- Euphoria

Over sedation

- Sleepiness **
- Visual disturbances [“ doctor the room is spinning”]
- Sweating
- Laughing / crying **
- Nausea **

Q:When nitrous oxide sedation of a child , the child starts to laugh hysterically what should you do?
Lower the sedation by 5% and monitor the child [laughing Is a sign of over sedation]



Advantages of nitrous sedation	Disadvantages of nitrous sedation
<ul style="list-style-type: none">1- Non invasive2- Drug level may be altered or discontinued [titration]3- Rapidly onset and recovery4- Minimal impairment of any reflex – cough reflex5- Some analgesia [by changing the patient's mood their pain threshold become higher]	<ul style="list-style-type: none">1. Depends largely on psychological reassurance2. Mask close to the operation site3. Nasal seal may be broken during patient movement4. N2O pollution [the one at highest risk during No2 sedation is the dentist]

**Patient must respond favorably to tell-show-do for placing nasal hood and breathing through nose + nitrous sedation works best when combined with non pharmacological behavior management



Dental trauma in Primary teeth

Management of any dental trauma follows WASH protocol

W	Remember to ask 4 main questions <ul style="list-style-type: none"> 1- Where did it happen ? 2- where is the tooth? 3- Was there a state of unconsciousness after the trauma? 4- Was there previous trauma to the same area? <p>NOTE: if there was a state of unconsciousness you are not allowed to touch the child before doing a neurological exam</p>
A	Articulation – check if there is any disturbance in biting
S	Sensitivity – might be due to exposed dentine or pulp
H	How did it happen? [medico legal aspect] NOTE: in coherent stories of how the trauma happened indicate a planned trauma or abuse → you need to report

Tetanus shot decision depends on vaccine history and wound condition	
No need	Advisable
Child took 3 doses or more Vaccine was less than 5 Years ago Wound minor and clean	Child took less than 3 doses Vaccine was more than 5 Years ago Wound is big and soiled

Clinical examination of any trauma follows MP3 protocol

M	Mobility – tested in vertical and horizontal directions + compared to a sound tooth
P	Percussion – done on a normal tooth first + done horizontally and vertically Sharp sound → normal Dull sound → might indicate PA pathology Pain on vertical percussion → PA problem Pain on horizontal percussion → PDL problem
P	Pulp testing – done on normal tooth first , not very reliable [many false +ve and false -ve] Ex : false +ve if the tooth has liquefactive necrosis the pulp is necrotic but the canal is filled with fluid that can transmit the electrical current and the child feels pain in the PA region Or false -ve if the child does not feel anything but the pulp is vital [pulp is in state of shock]
P	Peri apical / panoramic radiograph



TRAUMA IN PRIMATY TEETH

TRAUMA CONDITION	Signs / symptoms	Management
CONCUSSION	TTP only	
SUBLUXATION	<ul style="list-style-type: none"> - Slight mobility but no displacement - Bleeding from gingival crevice 	Basic protocol
LUXATION [EXTRUSION]	<ul style="list-style-type: none"> - Tooth appear to be separated from it's socket - Bleeding from gingival crevice - Looseness 	Depending on degree of looseness either reposition or extract + basic protocol
LATERAL LUXATION	<ul style="list-style-type: none"> - Alveolar bone fracture - Tooth is inclined palately [firm] or inclined labially [loose] - Bleeding from gingival crevice 	<ul style="list-style-type: none"> - Spontaneous repositioning - Repositioning - Extraction + basic protocol
INTRUSION	<ul style="list-style-type: none"> - Tooth is <u>firm</u> - Infra occlusion - Alveolar bone fracture - Bleeding from gingival crevice 	<ul style="list-style-type: none"> - Spontaneous repositioning - Extraction + basic protocol
AVULSION	<p>Tooth is completely out of the socket</p> <p>NOTE: if the tooth is not found in the vicinity of the accident, do a chest X-ray To verify it is not inhaled inside the air way</p>	<ul style="list-style-type: none"> - DO NOT REIMPLANT - Just wait for the permanent tooth to erupt
ENAMEL INFARCTION	Crack in the enamel without tooth structure loss or just chipped enamel	<ul style="list-style-type: none"> - Fluoride application - Widen the crack with a small round bur and it with GIC - Smoothen the rough edge or place composite
ENAMEL FRACTURE		
ENAMEL DENTIN FRACTURE WITHOUT PULP	<ol style="list-style-type: none"> 1- LA → Clean the area with saline / CHX → Disinfect with NaOCl 2- Place GIC then build up with composite 3- F/U = radiograph after 6-8 week and after 1 year 	
ENAMEL DENTIN FRACTURE WITH PULP	<ul style="list-style-type: none"> - Pulp capping : <ol style="list-style-type: none"> 1. LA → Clean the area with saline / CHX → Disinfect with NaOCl 2. Place capping material CaOH₂ or MTA 3. Place GIC then build up with composite F/U = radiograph after one week , then 6-8 week and after 1 year - Partial pulpotomy - Extraction 	
CROWN ROOT FRACTURE WITHOUT PULP	Bleeding horizontal line on the crown	<ul style="list-style-type: none"> - Extraction - Zirconia pedo crowns - GIC and composite [you remove the fragment and place GIC apically and then composite]
CROWN ROOT FRACTURE WITH PULP		<ul style="list-style-type: none"> - Extraction - Pulpotomy + GIC & composite - Pulpotomy + zirconia pedo crown



ROOT FRACTURE		<ul style="list-style-type: none">- Extraction- If there is a small root fragment left leave it → will be pushed out by the erupting perm
ALV BONE FRACTURE	<p>Group of teeth inclined palatally You will just see PDL widening on the xray No damage to perm tooth because the tooth moves away</p>	<ul style="list-style-type: none">- Clean the area → LA → reposition fragment using 2 fingers [one palatal and one buccal] until you hear a click → place splint for 4 weeks- don't attempt to move after you hear the click you might damage the perm tooth bud- F/U after 1 week , 3-4 weeks, 6-8 weeks

***** basic protocol = Careful observation & watchful follow up + NSAIDs + Good OH + Inform parents about future possibilities [tooth might change color or become necrotic]***

Primary teeth have an aprismatic layer covering the enamel → this will make etching harder [the layer must be removed by gently by moving the bur over the surface to expose the prismatic enamel that can be etched] – **in primary teeth you need to etch longer [for 20 seconds]**



Dental trauma to young permanent teeth

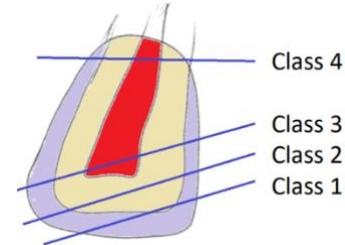
If a primary tooth is subjected to trauma and breaks it is because it is weakened by caries and not because of the trauma

If a sound tooth is subjected to traumas either intrusion or avulsion

Most to least affected : upper centrals → lower centrals → upper laterals → lower laterals

Ellis classification of permanent teeth fractures

- Class 0 = crown infarction
- Class 1 = only enamel
- Class 2 = enamel + dentine
- Class 3 = enamel + dentine + pulp
- Class 4 = entire crown
- Class 5 = root fracture



Anderson classification:

Uncomplicated crown fracture → Ellis 1 and 2

Complicated crown fracture → Ellis 3 and 4 [involves pulp or root or both]

Q: why can't we apply Ellis classification to primary teeth ? when primary teeth are subjected to trauma they will not fracture and they will be displaced into the bone [because the jaw bone is weaker than teeth in children]

The main aim of treating trauma of young permanent teeth is :

- A. Save the pulp
- B. Save the space

TRAUMA IN YOUNG PERMANENT TEETH

CONDITION INFRACTION	Signs / symptoms	Management
INFRACTION 	Incomplete crack in the enamel without loss of tooth structure	Etch → bond and seal or make small cavity and fill with composite according to the size of the damage + basic protocol
ENAMEL FRACTURE ELLIS 1 	Fracture confined to the enamel with loss of tooth structure	Smoothen or do composite filling according to size of the damage. + basic protocol



ENAMEL + DENTINE FRACTURE ELLIS 2		Fracture confined to the enamel + dentine [without the pulp] with loss of tooth structure	Glass ionomer indirect pulp cap then build up with composite or do FRAGMENT restoration [Exact original shape/ shade + Fragment acts as a mega filler for composite resin] – hold the fractured fragment using soft wax piece
ENAMEL + DENTINE+ PULP FRACTURE ELLIS 3		Fracture of the enamel + dentine [with the pulp] and loss of tooth structure	Pulp capping or pulpotomy
CROWN-ROOT FRACTURE WITHOUT EXPOSING THE PULP		Fracture of the enamel + dentine + cementum [without the pulp] and loss of tooth structure	extraction of loose fragment and restoration of the crown remaining or fragment restoration using GIC adhesive cement
CROWN-ROOT FRACTURE WITH EXPOSING THE PULP		Fracture of the enamel + dentine + cementum [with the pulp] and loss of tooth structure	<ol style="list-style-type: none"> 1. Fragment removal then pulpotomy 2. Extraction (of the whole tooth). 3. Orthodontic extrusion. 4. Surgical extrusion. 5. Coronectomy
ROOT FRACTURE		Fracture of the dentine + cementum [with the pulp]	<p>Reposition in the socket + splint [fracture line will not disappear on the xray]</p> <p>Apical root fracture have best prognosis because they are closest to blood supply and furthest away from the oral cavity + bacteria</p>
CONCUSSION		TTP	<p>Relief the contact with the opposing splinting is not needed it is only to relief the child</p>
SUBLUXATION		Slight mobility but no displacement Bleeding from gingival crevice	<p>Relief the contact with the opposing splinting is necessary</p> <p>F/U because the tooth might need RCT, or apexification or bleaching [an abscess might form or it changes color]</p>
EXTRUSION		Tooth is displaced coronally – longer than adjacent teeth Loose tooth No response to EPT Widening of PDL	<p>Reposition the tooth</p> <p>Relief the contact</p> <p>Splint for 4 weeks</p>
LATERAL LUXATION		Tooth is firm – locked inside bone Crown displaced palately and root labially No response to EPT Bleeding from gingival crevice Widening of PDL	<p>F/U because the tooth might need RCT, or apexification or bleaching</p>

**INTRUSION****The worst prognosis.****Alveolar bone fracture****Tooth is firm – locked inside bone**

In cases of total intrusion → Needs periapical radiography to distinguish from avulsion.

Re-eruption is expected within **3 months** for incompletely formed roots.

Monitor pulp condition

Ortho-assisted re-eruption is indicated in fully formed roots or if the tooth did not erupt in 3 months, but it might fail should ankylosis occur.

Surgical repositioning may produce a faster result.

NOTES:

- Sometimes the trauma causes the fragment to get a **brighter shade** than the rest of the tooth. Still you can use the fragment and then do **full labial composite resin veneer** to mask both the color difference and the fracture line.
- In case of a big trauma and you want a quick solution to maintain pulp vitality and prevent space loss → use celluloid crowns filled with CaOH₂
 - **Open apex has better prognosis than closed apex + maxillary teeth have better prognosis than mandibular teeth [because of rich blood supply]**
 - **CAUTION: NOT ALL DISCOLORED TEETH HAVE NECROTIC PULPS - TRAUMA CAN CAUSE BLEEDING AND DISCOLORATION**
 - **Dystrophic pulp calcification can be left untreated if it is asymptomatic**
 - during splinting period there will be an initial transient breakdown of tissues prior to tissue repair.

Pulp capping procedure :

- 6- LA → Clean the area with saline / CHX → Disinfect with NaOCl
- 7- Place capping material CaOH₂ or MTA
- 8- Place GIC then build up with composite
F/U = radiograph after 6-8 week and after 1 year

Pulpotomy procedure:

- 1- LA → Clean the area with saline / CHX → Disinfect with NaOCl
- 2- Perform pulpotomy to a depth of 2 mm
- 3- Control bleeding by saline cotton pellet
- 4- Place CaOH₂ or MTA
- 5- Place GIC then build up with composite
F/U = radiograph after 6-8 week and after 1 year



Management of avulsion in primary teeth

Avulsion = total separation of the tooth from the socket

CAUTION: if the parent tells you that they couldn't find the tooth , take a radiograph it might be a case of total intrusion – if not take chest x ray the child might have inhaled the tooth.

Q: a distressed parent calls you and tells you “ my child's tooth is knocked out” what should I do ?

- 1- Hold the tooth by the crown [the white part] and avoid touching the root.
- 2- If the tooth is clean, try to put it back.
- 3- If the tooth is dirty, **don't wash it**.
- 4- Put the tooth in milk, contact lenses solution or under the child's tongue. - **Don't wrap it in cotton or tissue**.
- 5- Visit dental facility ASAP.

**IF THE TOOTH IS PRIMARY – DO NOT
PUT IT BACK!**

**THERE IS A HIGH CHANCE IT WILL
GET ANKYLOSED AND PREVENT THE
ERUPTION OF THE PERMANENT
TOOTH**



If the PDL cells are assumed to be alive → replant the tooth then do endo

If the PDL cells are assumed to be necrotic → endo then replant

The PDL cells are assumed to be alive and the tooth can be replanted [without being stored in any solution] if it is done **within 30 mins of the accident**

Solution	How long the PDL cells will stay viable
Hanks balanced salt solution	24 hours
Milk	6 hours
Saliva	2 hours
Saline	1 hour
Nothing	30 mins



Management of avulsion

Immediate replantation [Tooth replanted onsite of injury by parents or by an adult in the vicinity]	Debride the mouth and congratulate the parents for a well done job + FARAH
Early replantation [Tooth brought to your clinic with “assumed” vital PDL- kept in the correct solution]	Debride the tooth gently [remove visible dirt using saline] Debride the socket gently. Re-insert the tooth gently. If the bone is sound, you may hear or feel a click that it's in the exact right position. Splint + FARAH
Late replantation [dry tooth]	Gently remove necrotic PDL. Rinse tooth with 2% NaFl solution to help minimize possible ankylosis. Extrirpate pulp tissue. Then fill root canal with Ledermix paste. Gently debride the socket. Gently insert the tooth back. Splint + FARAH

FARAH protocol

- F** Fix (splint) the tooth.
- A** Attend for any tooth fragment (chest X-ray)
- R** Repair (suture) damaged soft tissue
- A** Antibiotic and NSAID's
- H** Home care instructions.

Splinting

- A. **Rigid** = does not allow physiological movement [composite with ortho wire] – high chance of ankylosis
indicted when there is **bone fracture** [mostly avulsion and lateral luxation cases]
- B. **Non rigid** = allows physiological movement [composite with nylon thread or wired orthodontic bands] – minimizes chance of ankylosis

Q: How long should the splint stay for ? minimum 2 weeks and then evaluate if a 3rd week is needed – in case of alveolar bone damage → 4 weeks

Q: is RCT needed after the replantation of a young perm tooth ?

- If the apex is closed → Start treatment within 2 weeks, fill the canal with **Ledermix for 3 month**, Followed by **CaOH for another 3 months** then proceed with RCT



- If the apex is open [more than 2 mm] and the tooth is replanted immediately or early → no need for RCT unless there is **evidence of infection**. In case of infection → do **Apexification** [Fill the canal with **Ledermix for 3 month**, Followed by **repeated CaOH canal medication every 3 month** , Until apical calcification is evident by x-ray]

One of the complication after replantation is **external replacement resorption** : but at least the replanted tooth will maintain the proper bone height and the proper position of the adjacent teeth until the child can get an implant

To prevent external resorption → place multiple dressings of CaOH₂

Ankylosis can occur after replantation [since the jaw is growing the area of the ankylosed tooth will not grow and cause a deformity]

To minimize ankylosis :

- 1- Extra alveolar time should be kept to minimal and storage media should be appropriate
- 2- Handling [rinse with 2% NaF]
- 3- Splinting [with non rigid splints]

Q: **how can ankylosis be managed?** By de coronation

De coronation

- 1- Crown is cut
- 2- intentional trauma to the periapical region to establish a healthy blood clot which will develop into healthy bone suitable to support an implant.
[insert a bur all the way to the apex and leave a thin shell of the root → this shell will later be replaced through external resorption to form bone that is suitable for implant placement]

Auto transplantation = using supernumerary or impacted teeth to replace an avulsed tooth

Latest advancements:

- 1- using stem cells from deciduous teeth to grow tooth germs
- 2- **Emdogain**: enamel matrix derivative → may mediate cementum formation.
- 3- **Alendronate** → inhibits odontoclastic activity and prevents external resorption



Apexogenesis & apexification

- stem cells are there waiting for signals from growing permanent teeth to turn into odontoclasts to start the process of physiologic shedding

complicated crown fracture in young permanent teeth [open apex] :

- A. tooth is vital → you can do pulp capping OR pulpotomy OR apexogenesis
- B. tooth is non vital → you can do apexification OR pulp revascularization

Apexogenesis	Apexification
Indication: VITAL young perm tooth with open apex	Indication: non vital young perm tooth with open apex
<p>Aim: preserve vital non inflamed pulp tissue to continue root formation and closure of the apex Maintain proper C:R ratio [because the root will continue to grow]</p> <p>Procedure:</p> <ol style="list-style-type: none"> 1- Local anaesthesia 2- Rubber dam isolation 3- amputation of coronal pulp tissue with a <u>high speed diamond bur with constant water cooling</u> + Pulp is washed with saline until hemorrhage stops - this is to minimize irritation to the pulp Removal of 2 mm of pulpal tissue to a level of vital uncontaminated tissue 4- Non-setting CaOH / MTA is placed over the pulp <u>directly</u> and is then covered with a setting CaOH. Calcified barrier will form underneath the CaOH2 + stem cells in the pulp will be stimulated to form odontoblasts to continue root formation & close the apex 5- GIC base is placed over the dressings and the tooth is restored with composite resin. <p>The technique may be performed at any level of the root canal F/U: every 3 -6 months with pulp vitality tests + Radiographs to check for hard tissue barrier formation and continued root development</p>	<p>Aim: create an apical hard tissue barrier that will allow root canal filling to be placed Maintain the tooth in the arch for function + aesthetics</p> <p>Procedure:</p> <ol style="list-style-type: none"> 1- Remove pulp tissue 2- Place CaOH2 to create apical hard tissue barrier 3- RCT can be completed after the barrier is formed <p>Root will not elongate more and will stay at that stage of growth</p> <p>Very poor prognosis because the root is short + dentine walls are very thin → tooth fractures cervically</p>



Regenerative endodontics

Indication : **non- vital** young perm tooth with open apex

Procedure:

- 1- Irrigation with 2.5% NaOCl + treatment with triple antibiotic paste
- 2- Ca(OH)2 medication in the coronal third of the root canals for 3 weeks
- 3- induction of apical bleeding + coronal sealing with white MTA

this process may lead to completed root formation

Decoronation	Regenerative endodontics
Apex is traumatized to form a blood clot that will turn into bone and allow the placement of an implant → tooth is completely destroyed	Apex is traumatized to form a blood clot that will act as a scaffold for un differentiated mesenchymal cells to enter the pulp and differentiate into odontoblasts to continue root formation → tooth is preserved



Pediatric facial injuries

Crumple zones = areas in the facial skeleton that absorb the traumatic energy and dissipate it away from vital structures

Ex: Orbital bones are designed To absorb the impact and break away from the eye ball [broken specules go to sinus direction and not to orbital cavity] + The condyle is designed to break and prevent energy from going into the middle ear

The major crumple zone in the skull = the nasal cavity

- Most traumas in children are sustained by **the nose followed by the mandible**
- The overall frequency of facial fractures in children is much lower than that in adults
- It is lowest **in infants** and **increases progressively with age**
- Two peaks are observed in children's facial fractures **6-7 years and 12-14 years**

NOTE: if you see malunion of facial fractures → suspect child abuse

Q: how is the skull and facial skeleton different in children ?

- 1- Cranium /Face ratio. 8:1 at birth - 2.5: 1 for adults.
- 2- Extent of para nasal sinuses is different
- 3- **Type of bone** and soft tissue.
- 4- Dental development [developing dentition]



Clinical picture of maxillary fractures

- 1- Facial swelling
- 2- Occlusal disturbance
- 3- Peri orbital emphysema
- 4- Peri orbital ecchymosis
- 5- Diplopia
- 6- CSF epistaxis
- 7- Mid facial mobility + paresthesia

Clinical picture of mandibular fractures

- 1- Facial swelling
- 2- Occlusal disturbance
- 3- Chin asymmetry
- 4- Sublingual ecchymosis
- 5- Trismus

NOTE: if you see CSF epistaxis [clear fluid coming out of the nose] → indicates fracture of the base of the skull [DO NOT TOUCH THE PT AND CALL A NEUROLOGIST]

Children have:

- less facial fractures [cranium takes all of the impact]
- **More susceptibility to green stick fractures**
- More susceptibility to cranial injury

GREENSTICK FRACTURE: the ends of the bone are still connected and there's only a crack on one side of the bone [most common fracture in children]

Q: why are radiographs in children not very accurate in cases of trauma [limitations of radiographs in pedo] ?



- 1- Incompletely calcified bone with underdeveloped cortical plates.
- 2- Numerous tooth buds undergoing development may mask injured areas.
- 3- Small nasal sinuses.
- 4- Green stick fractures are hard to recognize due to lack of bone displacement.
- 5- Questionable child cooperation.

Q: what can you do if you suspect a fracture and you can't take a CBCT or radiograph? Ask the child to break a tongue depressor with their open – if they can't → suspect a fracture



Q: how can you detect orbital floor fractures clinically ? Ask the child to look up → one eye will stay dropped because part of the eye muscle is “trapped” inside the orbital fracture.

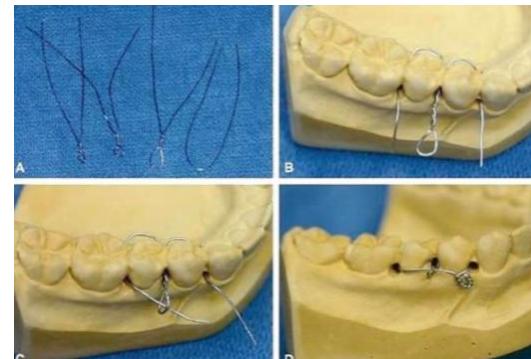
Q: most of facial fractures in children are treated by? conservative tx

Management of facial fractures

- 1- **Conservative Tx** [most commonly used]
- 2- **Closed reduction** – you bring the teeth into occlusion and fix them using ivy loops or IMF
- 3- **Intermaxillary fixation [IMF]** – done for 3 weeks during this time the child eats soft food that goes through a straw behind the last molar tooth
- 4- **Osteosynthesis [open reduction]** – access surgically then bring both ends of the fractures together and fix them with surgical plates [lateral removed so they don't disturb growth]

If the fracture is between 2 teeth → ivy loop

IMF = ivy loop on the lower + ivy loop on the upper and then tie them together by another wire





Management of medically compromised children

Congenital heart disease

Clinical appearance:

- A. Cyanosis of the mucosa
- B. Shortness of breath
- C. Clubbing of the fingers

Dental management: those pts have risk of **developing infective endocarditis** → treatment should only be done on stable pts after consultation with a cardiologist

If the child has an unstable cardiac condition → you cannot do anything until the condition is stable

Q: which cardiac conditions need ABX prophylaxis ? **

- 1- Prosthetic cardiac valve or prosthetic material used in valve repair
- 2- Previous endocarditis
- 3- Congenital heart disease in the categories below:
 - Unrepaired cyanotic congenital heart disease including shunts
 - Completely repaired defects in the **first 6 months**
 - Repaired with residual defects [ex: heart murmur]
- 4- Cardiac transplantation recipients with cardiac valvular disease

NOTE: if surgery to repair congenital heart defect was done more than 6 months ago no need for ABX

Q: which dental procedures need ABX prophylaxis? All procedures that involve manipulation of the gingival tissues / periapical region of teeth or perforation of the mucosa

ABX is NOT needed in :

- 1- Placing ortho appliances / brackets or prosthetic devices
- 2- Injections in non infected tissues
- 3- Bleeding from trauma to the lips or mucosa
- 4- Shedding of deciduous teeth
- 5- Radiographs

ABX prophylaxis in pediatrics [single dose 30 -60 mins before the procedure]

Route	Medication	Dose
Oral	Amoxicillin	50 mg / kg
Unable to take oral medication	Ampicillin	50 mg / kg [IV or IM]
Allergic to penicillin	Azithromycin	15 mg/kg
Allergic to penicillin and cannot take oral medication	Clindamycin	20 mg / kg [IV or IM]



ABX for infections in pediatrics [abscess, odontogenic infections]	
Medication	Dose
Augmentin	312 mg in 5 ml OR 157 mg in 5 ml [for very young children]
Amoxicillin	25 mg / kg
**Both can be combined with metronidazole 7 – 7.5 mg /kg	

Pediatric dosage for paracetamol =
15 mg / kg

Asthma

Dental management :

if the child has an asthmatic attack of wheezing and coughing → give 2-3 puffs of Ventolin
**you need to check if the child is under steroid medication [given in severe cases of asthma]
because long term steroid therapy can cause adrenal crisis and the child might collapse**

NO CONTRAINDICATION FOR NITROUS OXIDE SEDATION

Cystic fibrosis : respiratory disease

CAUTION: those children are treated with tetracyclines and have teeth stains

Management: Use of general anesthesia must be discussed with respiratory pediatrician Long appointments should be avoided

Renal disease

End-stage renal failure → progressive hypertension, fluid retention and build-up of metabolites

Dental implications :

1. Growth retardation
2. Pale and Bleeding tendency
3. **Children on dialysis are under anticoagulants [heparin → risk of bleeding]**
4. **Caries rate is low due to ammonia release**
5. **Uraemic stomatitis**
6. Tooth calcifying during renal failure will exhibit hypoplasia

Liver disease

Clinical appearance = jaundice

Dental implications:

- A. **Intrinsic blue-green stain of primary teeth**
- B. Coagulation disorder (vitamin K-dependent)
- C. Liver transplant recipients are immunocompromised
- D. Altered drug metabolism **



Diabetes

Type I or insulin dependent is the most common in children

Dental implications :

Impaired defense against infection
delayed healing

Antibiotic prophylaxis are recommended for invasive dental procedures

Morning dental appointments [after insulin injection and regular meal] + always keep glucose source ready
If they are being treated under GA [dextrose and insulin infusion]

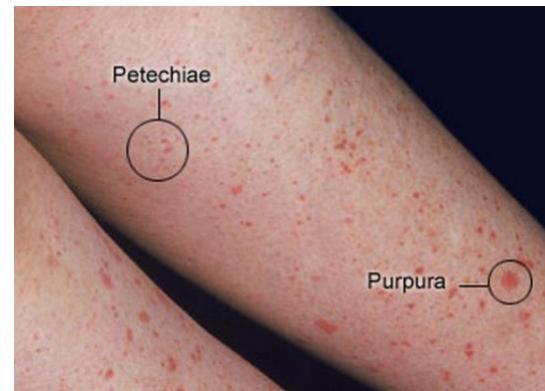
If the pt is on steroids → stress from dental procedure can cause adrenal crisis , you need to put the child under IV steroids before the procedure and then taper the steroids after the procedure is done.

Platelet disorders

Clinical signs : petechiae [pinpoint bleeding] , purpura [larger subcutaneous bleeding]

Thrombocytopenia :

Dental implication: failure of the blood clot to form [it is preferable to have platelet levels $>50 \times 10^6 /L$ before extraction]



Coagulopathies

- **haemophilia A** (deficiency of factor 8)
- **haemophilia B** (deficiency of factor 9)
- **von willebrand's disease** (abnormality of factor 8 molecule complex)

Dental implications:

- **Extraction and periodontal therapy requires factor replacement** with consultation with haematologist
- **Endodontic therapy can be safely carried out** without factor replacement
- **Use rubber dam to minimize chance of ST injury**

Thalassemia

avoid treatment if hemoglobin is less than 100 g/L

Leukemia

Acute lymphoblastic leukemia (ALL) : is the most common in children

Oral Complications:

- Erosive or ulcerative lesions
- Oral infection & Candidiasis
- Gingival bleeding
- **Gingival hypertrophy -direct invasion of tissue by an infiltrate of leukemic cells**
- **Spontaneous dental abscess formation**
- Loss of teeth: necrosis of the PDL



NOTE: if you notice that the child has gingivitis and abscess formation without any local cause → test for leukemia

Management:

- 1- No active dental treatment should be carried out untill the child is in remission (remove abnormal cells from the blood and bone marrow)
- 2- Dental pain treated conservatively by the use of antibiotics and analgesics
- 3- Swabbing the mouth with chlorhexidine mouthwash and use of antifungal agents + LA preparations at mealtime [to reduce pain from the ulcers]

Once leukaemia is in remission dental treatment done with the following adjustment:

- 1- Haematological information required for invasive procedures
- 2- Prophylactic antibiotic to prevent postoperative infection
- 3- Children who are immunosuppressed need active antifungal treatment
- 4- Long term preventative care

Immunodeficiency

Qualitative defects in neutrophils

- Leukocyte adhesion defect
- Chediak-Higashi syndrome

Quantitative defects in neutrophils

- Neutropenia
- Cyclic neutropenia

Phagocytic disorders

- Agammaglobulinaemia

Defect in microbial killing

- Chronic granulomatous disease

Primary immunodeficiencies



- Involving T cells, B cells, complement or combined defects and acquired disorders (e.g. HIV, chemotherapy and radiotherapy)

Dental implications:

- 1- Candidiasis
- 2- Severe gingivitis/prepubertal periodontitis
- 3- Gingivostomatitis
- 4- Recurrent aphthous ulceration
- 5- Recurrent herpes simplex infection
- 6- **Premature exfoliation of primary teeth ****

Management :

- 1- Prophylactic antibiotic therapy
- 2- **Extraction of pulpal involved teeth ****
- 3- Acyclovir for recurrent HSV
- 4- Antifungals
- 5- Chlorhexidine 0.2% mouthwashes

Organ transplants : those children are mostly on cyclosporine immunosuppressants →

Management :

1. Eliminate infection [teeth with large caries, tooth soon to be exfoliated should be extracted]
2. Perfect OH
3. **ABX prophylaxis before invasive procedures**
4. Gingivectomy if needed

gingival overgrowth

Cerebral palsy:

- Cognitive ability of a child with cerebral palsy should be determined because many patients have no intellectual impairment
- **Reflex limb extension patterns may be triggered when the limbs are in extension or when the head is unsupported → transfer of the child to the dental chair should be done with care**
- Gag, cough, bit and swallowing reflexes may be impaired or abnormal → Mouth props may be used but these kids are at risk for aspiration [all used instruments should be tied with floss to avoid being swallowed by the child]

Visually impaired

- Allow the child to touch the instruments and smell the materials + you need to explain to them before you do the procedure [do not surprise them because they can have a startle reflex and push you]
- **Use safety glasses as they are light sensitive**

Hearing impairment:

- Those children can lip read so face the child and speak slowly and clearly
- Try to learn basic sign language



- Maintain visual contact
- Deaf children are sensitive to vibration so introduce high speed hand drills with care
- Hearing aid volume need to be adjusted [lower the volume of the hearing aid device so they are not annoyed by the sounds in the dental clinic]

Down syndrome

- Determine the need for endocarditis prophylaxis [because some might have cardiac anomalies]
- Down syndrome children are susceptible to periodontal disease → emphasize on:
**daily tooth brushing with fluoride tooth paste 500ppm
0.12% chlorhexidine mouth wash in older children**

Pediatric oral medicine & oral pathology

Presentation of pathology in children is often different from adult

Odontogenic infections

Acute	Chronic
<ol style="list-style-type: none"> 1. sick and upset child 2. Raised temperature 3. Anxious and distressed parents 4. Red and swollen face [Facial cellulitis] posterior spread of maxillary canine fossa infection may lead to cavernous sinus thrombosis Mandibular infection may compromise the airway If infection has perforated the cortical plate child may not be in pain 	<ol style="list-style-type: none"> 1. Sinus tract 2. Mobile tooth 3. Halitosis [because of the puss] 4. Discolored tooth [because of the necrotic pulp]

Management of odontogenic infections in children :

- Removal of the cause + Local drainage and debridement
- Maintenance of fluids
- Use of antibiotics (penicillin or Amoxicillin + metronidazole or augmentin +/- metronidazole]
- 0.2% chlorhexidine gluconate mouth wash
- Pain control with paracetamol

If the child does not respond to oral ABX [persistent fever, raised tongue and difficulty breathing / swallowing] → transfer the child to the hospital to get parental ABX

ABX for infections in pediatrics [abscess, odontogenic infections]

Medication	Dose
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Augmentin	312 mg in 5 ml OR 157 mg in 5 ml [for very young children]
Amoxicillin	25 mg / kg
**Both can be combined with metronidazole	
7 – 7.5 mg /kg	
Paracetamol = 15 mg / kg	

Primary Herpetic Gingivostomatitis

- Most common cause of **severe oral ulceration in children**
- Mostly caused by **HSV I** [Usually occurs after 6 months of age]
- Fever , malaise then appearance of Vesicles and ulcers → Self-limiting ulcers heal spontaneously with in **10 to 14 days**

Management:

- 1- Oral fluids + Analgesics
- 2- Mouthwash 0.2% chlorhexidine gluconate
- 3- **Antiviral oral suspension for severe cases** - Administration of aciclovir **in the first 72 hrs of infection before the vesicle formation** may resolve the infection

Herpangia

- Caused by **Coxsackie group A virus**
- fever and malaise before the appearance of the vesicles → Self-limiting ulcers heal spontaneously with in **10 to 14 days**

Management: symptomatic care

- 1- Oral fluids + Analgesics
- 2- Mouthwash 0.2% chlorhexidine gluconate

Acute pseudomembranous candidosis

Thrush in infants [White plaques which on removal reveal an erythematous base]

Most common viral infections in children = herpangia and primary herpetic gingiva stomatitis

Most common fungal infection in children = Acute pseudomembranous candidosis

Management : Antifungal medication **Nystatin or amphotericin B** for at least 4 weeks

Recurrent aphthous ulcers

- **Minor aphthae** : crops of **shallow ulcers** [Yellow pseudomembranous slough with erythematous border] **measuring up to 5mm** on the **non-keratinized mucosa** - Heals with in **10 – 14 days**



- **Major aphthae:** on keratinized mucosa - Last longer and heal **with scarring**
Management: Symptomatic care + mouthwash + Topical steroids

Erythema multiforme

- Self limiting with mucosal involvement limited to the oral cavity
- target lesions occur on the limbs.
- This lesion has concentric colour with erythematous halo and central blister.

Management :

Debridement with 0.2% chlorhexidine gluconate + Adequate fluid replacement + Pain control

Stevens Johnson syndrome

- Acute febrile illness + generalized exanthema +oral lesions and purulent conjunctivitis
- Vesiculobullous eruption over the body
- Severe involvement of multiple mucous membranes: oral, vulva, penis and conjunctiva.

Management : Debridement with 0.2% chlorhexidine gluconate +Adequate fluid replacement and + Pain control

Eruption cyst or haematoma

Follicular enlargement appearing just before tooth eruption [Lesion tend to be blue-black] – the erupting tooth will eventually rupture it

Management : No treatment unless infected

Phenytoin enlargement

Enlargement of the inter dental papilla + delayed eruption due to bulk of fibrous tissue

Management : Maintenance of oral hygiene + 0.2% chlorhexidine gluconate mouth wash + Gingivectomy

Cyclic neutropenia

Episodic decrease in the number of neutrophils every 3 to 4 wks - Peripheral neutrophil count drops to zero during this period the child is susceptible to infection.

Recurrent oral ulceration, gingival and periodontal involvement resulting in mobile of teeth.

Management: Early preventive involvement + Dental care though all stages of cycle + 0.2% chlorhexidine gluconate mouth wash

Epstein's pearls

Small nodules present on midline of the hard palate



Bohn's nodules Remnants of dental lamina occur on the **labial or buccal aspect of the maxillary alveolar ridge**

Management: No treatment



Anomalies in pediatric dentistry

Hypodontia : less number of teeth – usually associated with microdontia / is part of a syndrome

Most commonly affected teeth = lateral incisors + mand 2nd premolars

- I. Anodontia : no teeth
- J. Oligodontia : few missing teeth

Hypodontia Is seen in:

- A. Rubella [german measles]
- B. Down syndrome
- C. Ectodermal dysplasia
- D. Cleft palate [most commonly missing tooth with CP = lateral incisor]

Cleft palate can cause failure of the tooth bud to develop → hypodontia

Or splits the tooth bud into two → hyperdontia

Management of hypodontia: pedodontist + orthodontist + prosthodontist

- A. Crowded arch → teeth are reshaped and adjusted to look like normal teeth
- B. Spaced arch → ortho tx + artificial teeth to act as space maintainers until the age of 20 [so the pt can get fixed prosthos]

- **Hyperdontia** : super numerary teeth – associated with (Cleido Cranial Dysostosis, Gardner Syndrome) – might occur on both sides of a cleft palate

Mesiobuccal = extra tooth between the central incisors [most common]

Paramolar = extra tooth in molar region either buccally or lingually

Distomolar = extra tooth behind the last molar

Hyperdontia can be **complex** [island of enamel , dentine and cementum mixed together as a disorganized mass] **or can be compound** [organized into tooth structures]

Management of hyperdontia: extraction of the extra teeth to prevent :

- 1- Ectopic / disturbed eruption.
- 2- cystic degeneration.

Fusion



- Union between dentin and/or enamel of two separately developed teeth
- One tooth missing - Radiographically, roots appear separate

Gemination



- Incomplete division of single tooth bud + Notching of the incisal edge.
- Normal teeth count - One root radiographically.



Microdontia

- smaller teeth than normal
- mostly lateral incisors and 3rd molars – can be associated with Ectodermal dysplasia & pituitary dwarfism
- **Management:** Build up when available space is convenient, consider extraction and orthodontic treatment.

Sanjad Sakati Syndrome Dwarfism + Mental retardation. + **Microdontia**. + High arched palate. + **Micrognathia**.

Macrodontia: larger than normal tooth

- **Management:** crown reduction to 1 mm is acceptable. Consider extraction and prosthesis, implants and or orthodontic treatment.

Dense evaginatus An **enamel covered tubercle** projecting from the **occlusal surface** of a premolar, canine or molar tooth.

- **Management:** Composite build-up to support the tubercle – Gradual enamel reduction



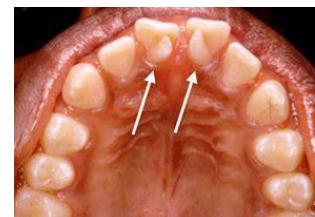
Dense invaginatus [dense in dente] : A developmental invagination of the cingulum pit with only a thin hard tissue barrier between the oral cavity and the pulp

- **Management:** Fissure seal as early as possible



Talon cusp A horn like projection of the **cingulum of the maxillary incisor teeth**.

- **Management:** If occlusal interference present - **gradual reduction of enamel or elective pulpotomy or RCT**
If it is not disturbing the pt → leave it





- **Enamel hypoplasia** = defective quantity of enamel
- **Enamel hypocalcification** = defective quality of enamel

Turner's hypoplasia: Localised infection or trauma to a deciduous tooth affects enamel formation of the underlying permanent tooth.

Amelogenesis imperfecta :

- normal size and shape.
- normal dentine and pulp. abnormal enamel hypoplastic/ hypomineralised or both



Dentinogenesis imperfecta : teeth have normal contour at eruption, but present with a distinctive amber-like hue

enamel is normal, but it is weakly attached to the dentine and is rapidly lost → teeth show marked attrition

- Type 1 – DI with osteogenesis imperfecta.
- Type 2 – DI "stand alone" with no systemic involvement.
- Type 3 – Brandywine type with large pulp chambers.



Regional odontodysplasia : Poorly mineralized enamel & Dentin - large pulp chambers with pulp stones present.



Taurodontism (Bull-like tooth) : molar with elongated crown & apically placed furcation of the roots, resulting in an enlarged rectangular coronal pulp chamber.

Associated with : Ectodermal dysplasia, Klinefelter's syndrome , Down's syndrome



Dilaceration : Sharp bend or angulation of the root - results from **trauma during tooth development**



Dilaceration

Concrescence : two or more teeth united by cementum



Concrescence

Hypocementosis: reported in some conditions including cleidocranial dysostosis and hypophosphatasia



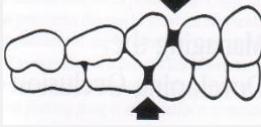
Developing dentition in pediatric pts

Q: what are self correcting anomalies in children ? anomalies that get corrected with time and by the eruption of the permanent teeth [Ex: large perm teeth , crowded lower anteriors , spacing between upper incisors]

At 2 years the primary dentition is complete [20 teeth] and the primary dentition continues till the age of 6 .

Primary teeth will undergo attrition leading to edge to edge occlusion.

Q: Edge to edge bite in children is normally seen at ? 5.5 years

AGE	DENTITION STAGE	NOTES
0 – 6 MONTH	Gum pads	No teeth just gum pads The gum pads contact posteriorly resulting in anterior open bite that is occupied by the tongue
6 – 36 MONTH	Eruption of primary teeth	The first primary tooth to erupt is the lower incisor Anterior teeth erupt in an upright position → less overjet There is deep bite
6 M – 6 YEARS	Primary dentition	A. Spaced dentition = less risk of crowding later on B. Closed dentition = more risk of crowding later on [but the increase in the intercanine width in the maxilla and the mandible + jaw growth gives space and prevents crowding]
		 
6-9	Early mixed dentition	Primate spaces = physiological spaces [present in both spaced and closed primary dentitions] Located mesial to the upper primary canine and distal to the lower primary canine. 
9-12	Late mixed dentition	When the first perm molar erupts , they erupt in an end to end occlusion then they will move mesially closing the lower primate space → resulting in class 1 relationship [early mesial shift] Eruption of the perm premolars and canines

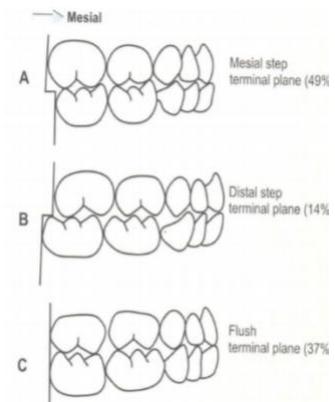


Molars the relationship

In the permanent molars the relationship is cusp to fossa and you use Angle's classification.

But in primary molar teeth the relationship is based on a line drawn distal to the primary second molars

- Mesial step = lower primary second molar is mesial to upper primary second molar
- Distal step = lower primary second molar is distal to upper primary second molar
- Flush terminal plane = straight line between upper and lower second primary molars

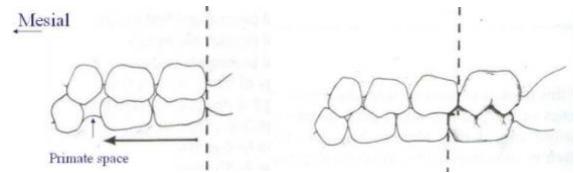


If the child has mixed dentition you need to classify the primary molar relationship and the perm molar relationship

Q: how does the end to end occlusion of the perm first molars change into class 1 relationship ?

Either by **early mesial shift** (age 6-9) [when the lower perm molars erupt and move mesially utilizing the lower primate space and resulting in class I occlusion] or by using the **late mesial shift** (age 9-12) [even if there is not enough primate space, the molar relationship will still change to class I because primary molars and canines have a larger MD width than perm premolars and canines [leeway space] → the perm molars use this leeway space and result in class I occlusion]

- Early mesial shift = the molars utilize the primate spaces to result in class I occlusion
- Late mesial shift = the premolars erupt and the molars utilize leeway space



Incisal liability the MD of the primary incisors is smaller than the MD of the perm incisors [tooth size difference is 6-7 mm]

Q: how does the incisal liability get adjusted ?

- 1- Interdental spacing will give 2-3 mm
- 2- Intercanine arch growth will give 3-4 mm
- 3- Incisor labiality [labial inclination of the upper incisors] will give 1-2 mm

Leeway space of Nance the MD width of the primary molars and canine is larger than the MD width of the perm premolars and canines

- Leeway space in the maxilla = 0.9 mm in one side and 1.8 mm in both sides
- Leeway space in the mandible = 1.7 mm in one side and 3.4 mm in both sides



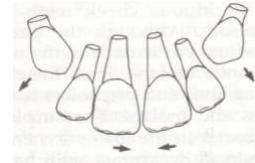
As you go from the primary dentition to the perm dentition the arch length is reduced [because of the mesial movement of the perm molars – the late mesial shift]

Ugly duckling stage [Broadbent phenomenon] – from 9- 11 years :

Flaring of the upper perm central and lateral incisors – it is a transient malocclusion that will be corrected by the eruption of the perm canines .

Q: what causes the ugly duckling stage / flaring in the perm incisors? because when the perm canines erupt they will apply pressure on the roots of the upper perm centrals causing the flaring. But as the canine continues to erupt down the diastema closes

Ortho tx is only done if after the eruption of the canine there was residual diastema.



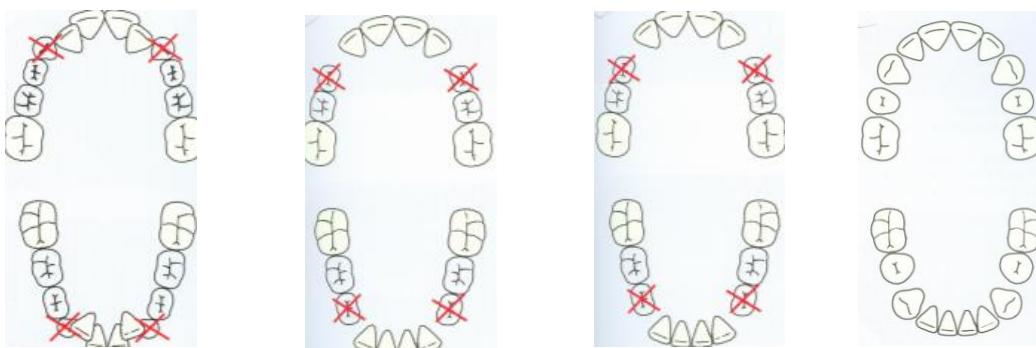
- If the molars are already in class I relationship but there is anterior crowding → hold the molars using a retainer [nance or lingual arch] and use the leeway space to adjust the incisor crowding.

Serial extraction: sequential extractions of primary teeth to allow the proper alignment of the perm teeth

ADV: no force is used to align the teeth + no problems with retention

DISADV: you need proper diagnosis + pt follow and compliance

- 1- The primary canines are extracted to provide space and allow the eruption of the permanent lateral incisors
- 2- The primary first molars are extracted to accelerate the eruption of the 1st perm premolars to **erupt before the perm canines if possible**
- 3- Extraction of the first perm premolars to allow the perm canines to move distally and fill the space of the 1st perm premolars



Final outcome after serial extractions:

- 1- Aligned incisors
- 2- Missing first premolar
- 3- Canine occupying space of 1st premolar
- 4- Spacing in the posterior segment



Interceptive orthodontic procedure in pediatrics

Interceptive procedures you see a problem during mixed dentition and you interfere at this stage to prevent it from becoming malocclusion in the permanent dentition

Tongue thrusting and thumb sucking will lead to → upper anterior proclination, anterior open bite and posterior crossbite.

- The pressure from the tongue on the palate will cause the anterior teeth proclination + the tongue does not allow the posterior teeth to contact → supra eruption of the post molars → anterior open bite
- The thumb also pushes the tongue down → allowing unopposed contraction of the buccinator muscles → maxilla constricts → posterior crossbite

If the thumb sucking habit is stopped → normal muscles will correct mal occlusion and the anterior open bite should close in 6 month

Habit breaking appliances used for tongue

thrusting and thumb sucking [usually used around the age of 8- 9 years]

Has a fence to prevent the thumb from entering the mouth and to prevent tongue thrusting

The fence should not contact the lower incisors



If the child cannot tolerate a removable appliance → do fixed nance appliance and then solder the fence over the wire



Hayley's reminder appliance



Blue grass appliance

Nance appliance + Teflon ring → prevents thumb sucking

The child plays with the ring then eventually stops the habit



Mouth breathing

Causes of anatomical mouth breathing :

- 1- Deviated nasal septum
- 2- Allergic rhinitis, nasal polyps
- 3- Enlarged adenoids or tonsils
- 4- Short upper lip preventing lip seal
- 5- Obstruction in the bronchial tree

Habitual mouth breathing is not associated with any anatomical defects – as a dentist you can only fix habitual mouth breathing – using **Oral screen** [acrylic plate placed on the buccal vestibule , the plate has perforations to allow breathing and you gradually close those perforations with composite so the child stops mouth breathing and breathes through the nose.

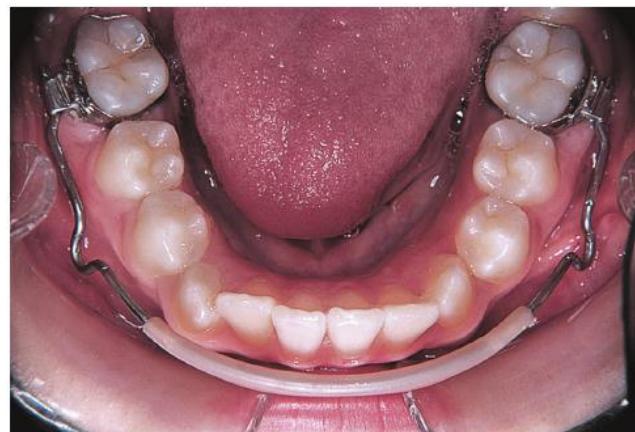


In Habitual mouth breathing – the lips are flaccid [low lip competence] → a ring can be attached to the oral screen so the child pulls the ring and the screen up and down to stretch the lips and increase lip tonicity and competence

Lip bumper can be used to correct lower anterior crowding and distalize the molars + correct lower anterior retroclination caused by lower lip biting

The acrylic will push the lower lip forward → prevent the child from biting on the lower lip

The force of the **orbicularis oris** will be transmitted through the acrylic button then through the wires to the molars causing distillation providing space to correct lower crowding.





Anterior crossbite [tx options]

- Tongue blade therapy
- Lower inclined plane (catalan's appliance)
- Removable Hawley's appliance [**simplest way to correct anterior cross bite**]
- Fixed appliances

Hawley's appliance = acrylic plate + Z spring [to move the teeth buccally] + posterior bite plane [to open the bite and bring the teeth to an edge to edge contact]



catalan's appliance = acrylic plate fixed on the lower arch and inclined at 45° [child wear's it for 10 -14 days only].

During biting the upper anterior teeth will slide against the lower 45° incline and move labially correcting the crossbite



Q: what happens if you give catalan's appliance for more than 10 days? It will cause supra eruption of the posterior teeth and anterior open bite

Tongue blade therapy = used when you see that the tooth is erupting in a crossbite relationship – you ask the child to bite down on a tongue blade to give a labial push while the tooth is erupting .

Tongue blade therapy is done for a few hours daily for 2-3 weeks



Fixed appliance= helix appliance or acrylic plate with midline screw to cause maxillary expansion



Tongue thrusting , mouth breathing , thumb sucking all cause posterior crossbite



Management of premature loss of primary teeth in mixed dentition

- 1- **Space supervisor** : done when the primary teeth are removed and you don't know whether the permanent tooth is erupting or not → take an OPG + PA radiographs
+ upper and lower casts for space analysis
- 2- **Space maintainer** : indicated if the tooth needs more than 6 months to erupt [there is bone covering the tooth + the root is not fully formed]
If more than 2/3 of the root is formed → the tooth is in active eruption [no need for space maintainer]
- 3- **Space regainer** : used if there is space deficiency

It takes 6-8 months for a tooth to move 1 mm in bone.

No bone covering the tooth + there is enough space or the tooth is in active eruption → just do space supervision

Space maintainers for unilateral space loss

- A. Band and loop / crown and loop



- B. **Distal shoe space maintainer:** used if the 6 is not erupted

Acts as an eruption guiding appliance to guide the eruption of the permanent first molar + a space maintainer for the permanent premolar

The distal extension will guide the eruption of the permanent molar in an upright position, once the 6 is erupted → remove the distal shoe and replace it with a band and loop space maintainer





Space maintainers for Bilateral space loss [mandible]

- **lower lingual holding arch** : the wire should contact the incisors



Space maintainers for Bilateral space loss [maxilla]

- Transpalatal Arch (Bar)** : used for space loss [as a space regainer] , both molars are moved together – can be used if the child can't tolerate nance acrylic button
- Nance Appliance**: has an acrylic button to prevent the molar from moving forward [more effective but the acrylic can be annoying to the child]





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